

THE ACTION OF ALCOHOLS AND ALDEHYDES
ON PROTEID SUBSTANCES. BY T. L. BRUNTON,
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IN our experiments, we have tested the effect of the series of liquid alcohols on proteid substances, in order to determine whether those higher in the scale differed from those lower. It was *à priori* possible that the results obtained might have some bearing on the physiological action of the alcohols and aldehydes.

The solutions of proteid used: were (1) egg-albumin, containing no globulin, (2) serum-albumin of the sheep, containing a trace of serum-globulin, and (3) a mixture of proto- and deuterio-albumose, prepared from Witte's "Pepton."

The method adopted was to drop the solution of proteid from a pipette into six times its bulk of the reagent: thus if 10 c.c. of solution were used, it was dropped into 60 c.c. of alcohol or aldehyde; if 5 c.c., it was dropped into 30 c.c.

The action was tested in the following manner:—

a. It was first noticed whether the reagent precipitated the proteid or not.

β. Whether the precipitate, if it occurred, was rendered insoluble after remaining some time under the alcohol or aldehyde. The solubility after treatment was tested by filtering off the precipitate, allowing the reagent to evaporate from the proteid, and testing how far this was soluble in distilled water.

γ. Whether any change of colour occurred in the precipitate.

Action on Egg-albumin.

1. *Of Alcohols.*

- | | | |
|-------------------|---|---|
| 1. Ethyl | } | Precipitate egg-albumin and coagulate almost completely in 4 days. |
| 2. Propyl | | |
| 3. Methyl | | Same as above, but coagulation not so complete. |
| 4. Isobutyl | } | Precipitate and coagulate, but to less extent than preceding, after 4 days. |
| 5. Isopropyl | | |
| 6. Tertiary Butyl | | |

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|-----------|--|
| 7. Amyl | Albumin-solution sinks to bottom of alcohol, becomes cloudy in 24 hours, and partially coagulated in 4 days. |
| 8. Heptyl | } Albumin solution falls to bottom of alcohol, which does not precipitate nor in any way change it. |
| 9. Octyl | |
| 10. Allyl | Precipitates egg-albumin at once, and coagulates it completely in 42 hours. |

The results therefore may be stated as follows: the precipitating and coagulating power of the alcohols are in the order mentioned, the most active being placed first, with the exception of allyl alcohol which is the most powerful of all. It precipitates and coagulates egg-albumin completely, within 42 hours. Ethyl, propyl, methyl, isobutyl, isopropyl and tertiary butyl alcohols do not differ greatly in coagulating power, while amyl alcohol is a partial coagulator, and heptyl and octyl have no effect on egg-albumin. For all practical purposes therefore the order of coagulating power of the alcohols on egg-albumin is as follows:

1. Allyl alcohol.
2. A group containing ethyl, propyl, methyl, isobutyl, isopropyl, and tertiary butyl alcohols: which are all active coagulaters, and do not differ markedly in their action.
3. Amyl alcohol: intermediate between the preceding and following group.
4. Group containing heptyl and octyl alcohols.

2. *Of aldehydes.*

- | | |
|----------------------|---|
| 1. Acetaldehyde | Precipitates egg-albumin white, turns it brown in 24 hours and causes almost complete coagulation at the end of 4 days. |
| 2. Propyl aldehyde | Precipitates: turns it slightly brown, and causes nearly complete coagulation at the end of 24 hrs. |
| 3. Isobutyl aldehyde | Partially precipitates at once: completely precipitates, without turning proteid brown, in 24 hours; albumin being mostly coagulated. |

Acetaldehyde is about equal in coagulating power to ethyl and propyl alcohol; the action is, however, evidently quite different since aldehyde turns the proteid brown. Propyl aldehyde is about equal in coagulating activity to acetaldehyde, while isobutylaldehyde has a slower action and does not like the other two aldehydes turn the egg-albumin brown.

*Action on Serum-albumin.**Of Alcohols.*

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|-------------------|---|--|
| 1. Methyl | } | Precipitate and almost completely coagulate serum-albumin after 23½ hours. |
| 2. Ethyl | | |
| 3. Propyl | | |
| 4. Isopropyl | | Precipitates; most of albumin coagulated in 23½ hours. |
| 5. Tertiary butyl | | Precipitates, but after 23½ hours standing, most of precipitate is soluble in water and coagulable by heat. |
| 6. Isobutyl | } | Do not coagulate. Isobutyl and amyl alcohol makes the solution of albumin cloudy, isobutyl to a greater extent than amyl. Heptyl alcohol has no effect whatever. |
| 7. Amyl | | |
| 8. Heptyl | | |

As regards this action on serum-albumin these alcohols may be arranged in the following order; the most active being placed first.

1. A group containing methyl, ethyl and propyl alcohols.
2. Isopropyl alcohol: almost as active as those of preceding group.
3. Tertiary butyl alcohol.
4. Isobutyl, amyl, and heptyl alcohols, the last having no effect whatever on serum-albumin.

Of Aldehydes.

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|-------------------|---|--|
| Acetaldehyde | } | Do not precipitate or coagulate serum-albumin. Aldehyde and propyl aldehyde turn the solution of albumin brown: isobutyl aldehyde has no evident effect. |
| Propyl aldehyde | | |
| Isobutyl aldehyde | | |

Action on albumoses—a mixture of proto- and deuterio-albumose.

Of Alcohols.

- | | | |
|-------------------|---|---|
| 1. Methyl | } | Cause a precipitate, which is quite soluble after 42 hours. |
| 2. Ethyl | | |
| 3. Propyl | | |
| 4. Isopropyl | | |
| 5. Tertiary butyl | | |
| 6. Isobutyl | | Causes a cloudiness in solution. No coagulation. |

7. Amyl	}	No effect on the albumoses. Does not precipitate.
8. Heptyl		A temperature of 40° C. for 48 hours does not
9. Octyl		produce any further effect of heptyl alcohol on
10. Allyl		albumoses: but amyl causes a slight cloudiness.
		Precipitates slowly and renders insoluble in 42 hrs.

Of these alcohols, then, allyl is the only one that renders the albumoses insoluble.

The group of methyl, ethyl, propyl, isopropyl, and tertiary butyl alcohols precipitate the albumoses without coagulating them. Isobutyl alcohol partially precipitates, while amyl, heptyl and octyl alcohols have no action whatever.

Of Aldehydes. No precipitation caused.

Acetaldehyde		Turns albumose solution brown in 19 hours.
Propyl aldehyde	}	Do not affect solution of albumoses.
Isobutyl aldehyde		

Placed in the incubator at 40° C. for 48 hours no further change is observed.

Remarks on the results obtained. The general result obtained as to the effect of alcohols on proteids is that the higher alcohols in the series have a less powerful action in precipitating and coagulating proteids than the lower ones. Allyl alcohol is an exception. It is a powerful coagulant of egg-albumin and is the only alcohol which coagulates albumoses.

